



# River Herring: Assessment of Fish Passage Opportunities in Lower Hudson River Tributaries (2009-2012)

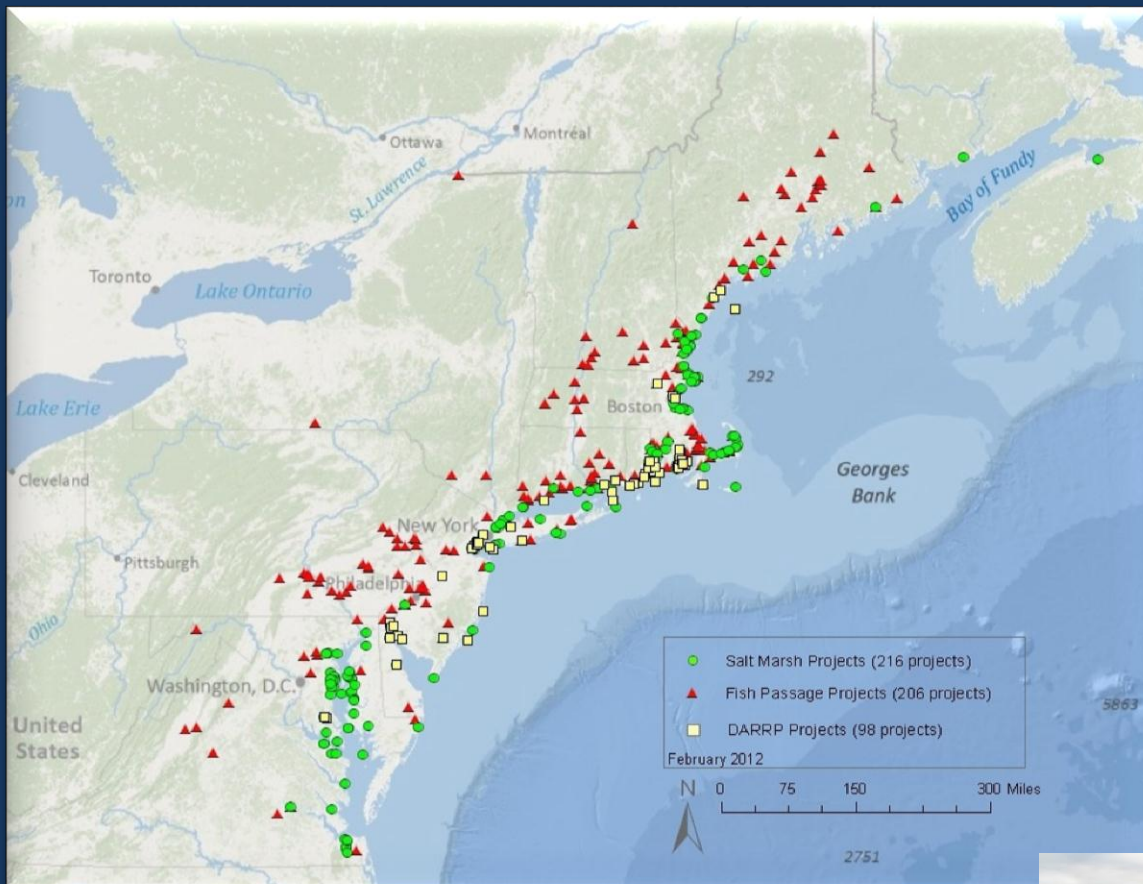
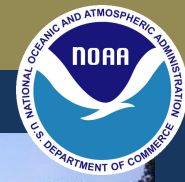
Presentation to NY Region River Herring Workshop,  
HRF, Oct. 22, 2012

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Lisa Rosman, NOAA, Office of Response and Restoration



# NOAA Funded Restoration Projects in the Northeast



- 216 salt marsh projects
- 206 fish passage projects
- Completed ~16,000 acres and ~1,400 stream miles
- Est. ~4,0000 acres and ~1,500 stream miles planned

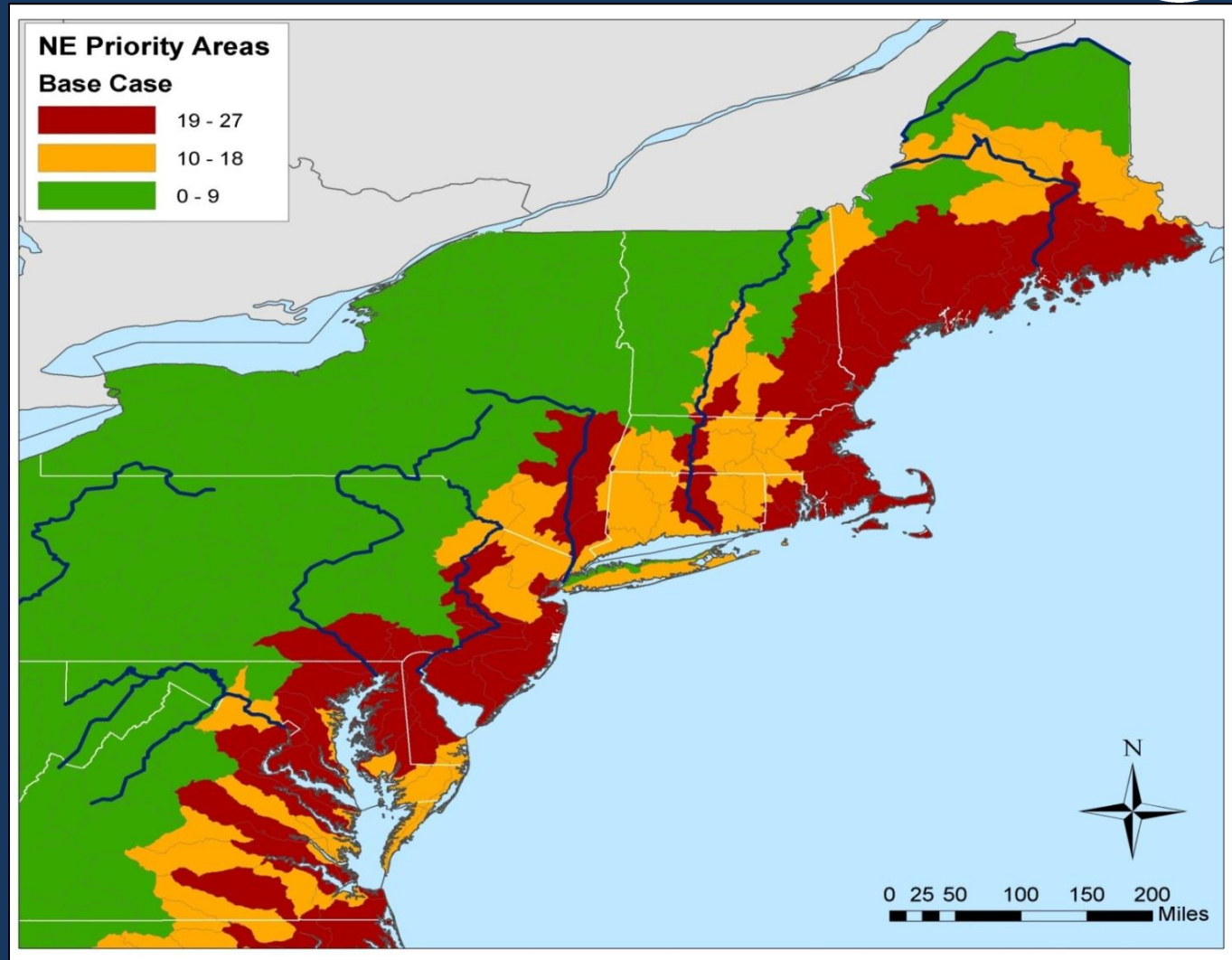


# Northeast Fish Passage Prioritization



**Goal:** to identify priority watersheds throughout the region to focus our fish passage projects.

- Developed list of priority species among the 14 diadromous species in the region
- Mapped co-occurrence and ranked



# Tributary Fish Passage Study of the Lower Hudson River



- Objectives
  - Investigate Changes to Fish Passage Impediments
  - Create an Inventory of Barriers for use as a Decision Making Tool
  - Work with other agencies and programs to further mutual goals

# Tributary Fish Passage Study of the Lower Hudson River



- Scope of Effort
  - 65 Tributaries
  - Update Prior Efforts (Schmidt et al 1996, Halavik and Orvis 1998, Machut et al. 2007)
    - Not Limited to number of barriers per tributary
  - Desktop Tools
    - Google Earth, Bing, Digital USGS 7.5 Series Topographic
    - Digital NYS Dam Inventory
  - Groundtruthing: 51 of 65 tributaries all or partially field verified to date
    - GPS, Video, Photography, Notes

# Tributary Fish Passage Study of the Lower Hudson River



- Proposed Actions
  - Dam Removal and Culvert Upgrades (Preferred)
  - Eelways, Fish Ladders, Rock Ramps (Less Preferred)
  - No Action (e.g., No Benefit, Owner Opposition, FERC Licensed, Regulatory Obstacle)

# Evaluation of Barriers - Criteria for Determining Passability



Presence/Absence of barriers and their physical attributes

Challenges for anadromous and catadromous fish presented by barriers (passable part, all, or none, seasonal, tidally restricted)

Stream gradient (steepness)

Categorization of streams by hydrologic type (perennial, intermittent, or ephemeral)



# Deliverables of the Study



## Database

GIS IDENTIFYING LOCATION ATTRIBUTES  
RESTORATION ATTRIBUTES  
HABITAT ATTRIBUTES  
SPECIES ATTRIBUTES  
OBSTRUCTION ATTRIBUTES  
ACRE BENEFITS  
CONTACT ATTRIBUTES  
BIBLIOGRAPHY  
COMMENTS AND CONCERNS  
PHOTO LINKS

Mapping Product

Video Library

Photo Library

Development of Prioritization Tool



# Study Scope: Sixty-five Lower Hudson Tributaries

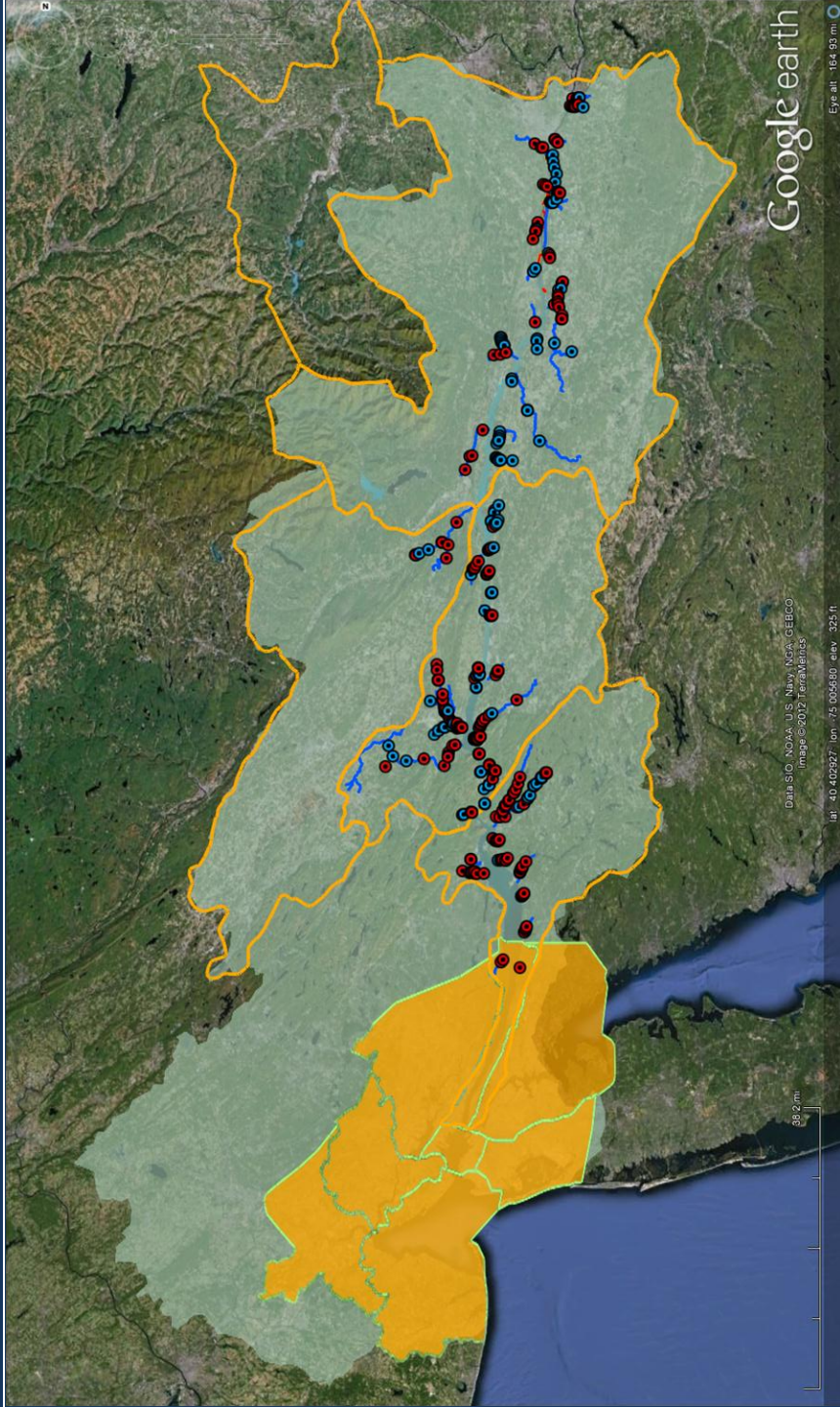


Annsville Creek  
Arden Brook  
Black Creek  
Breakneck Brook  
Catskill Creek  
Cedar Point Brook  
Cheviot Creek  
Claverack Creek  
Coeymans Creek  
Copper Mine Brook  
Coxsackie Creek  
Croton River  
Crows Nest Brook  
Crumb Elbow  
Dickey Brook  
Esopus Creek

Fallkill  
Fallsburgh Creek  
Fishkill Creek  
Foundry Brook  
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Gordons Brook  
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Maritje Kill  
Mill Creek (C)

Mill Creek (R)  
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Moordener Kill  
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Murderers Creek  
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Peekskill Hollow Brook  
Philipse Brook  
Pocantico River  
Poesten Kill  
Popolopen Brook  
Quassaic Creek  
Roeliff Jansen Kill  
Rondout Creek  
Roseton Brook



Saw Kill  
Sing Sing Brook  
South Bay Creek  
South Lattintown Creek  
Sparkill Creek  
Sprout Brook  
Stockport Creek  
Stony Creek  
Twaalfskill Creek  
Vlockie Kill  
Vloman Kill  
Wades Brook  
Wallkill River  
Wappingers Creek  
Wickers Creek  
Wynants Kill



## The NOAA Study Area Is:

A subset of the overall Hudson watershed, defined by the outer most bounds of the historic, current and potential migratory routes of river herring, Shad and American Eel within the 65 tributaries of the Lower Hudson Estuary.

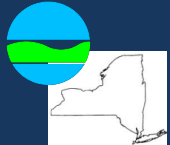


-  Partially Investigated Barriers
-  Fully Investigated Barriers

Partner agencies are also participating in the effort to restore diadromous fish runs, with some undertaking studies of their own.



NYSDEC Lower Hudson Watershed Studies



NY/NJ Harbor Estuary Program



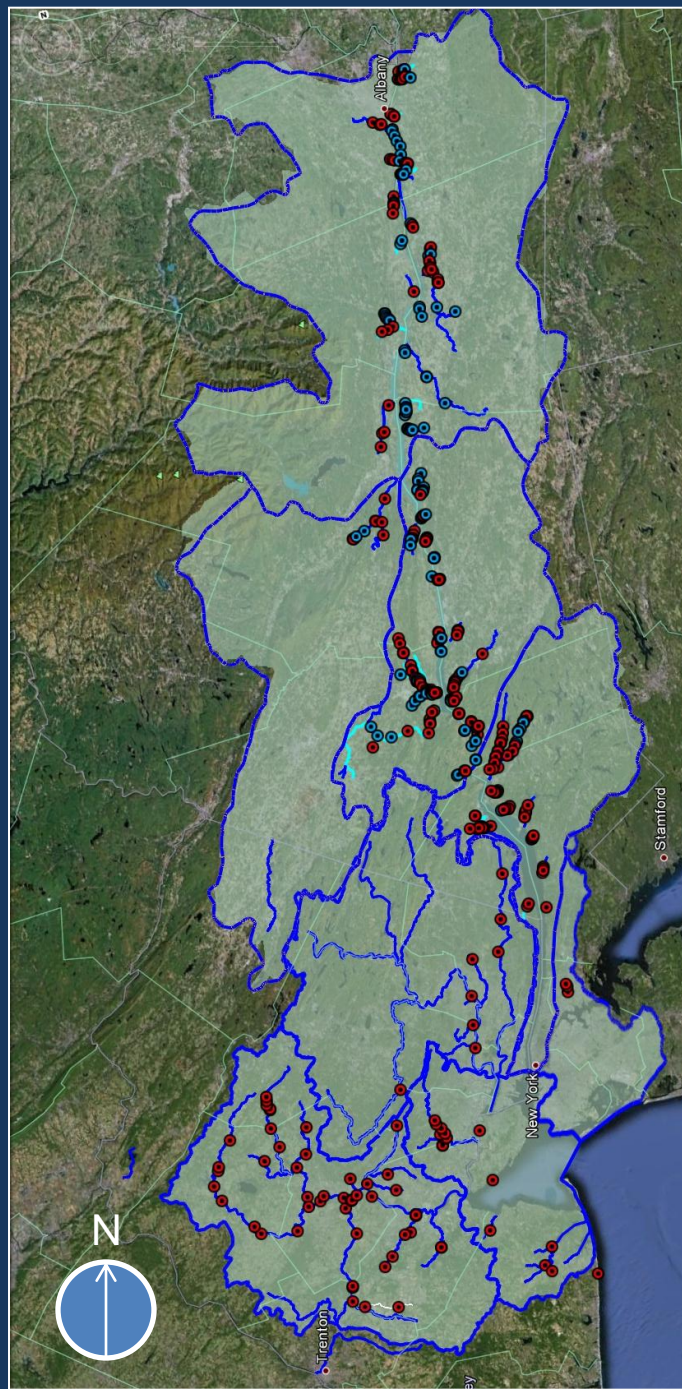
Hudson-Raritan Estuary Comprehensive Restoration Plan



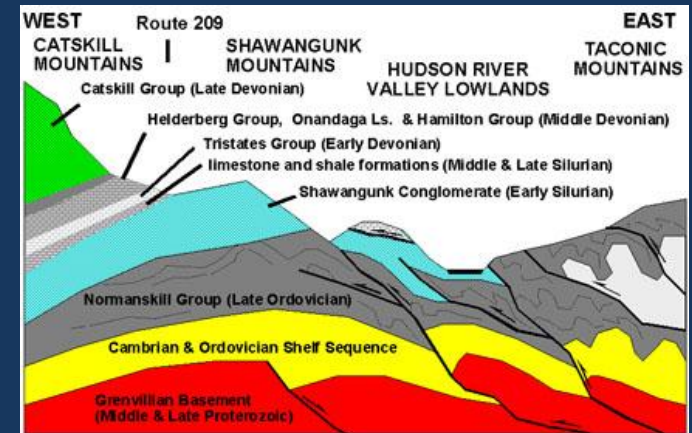


The Tale of two NOAA led Barriers Studies within the Hudson –Raritan Estuary.

Note the Spatial Patterns made by the Tributary barriers of the Hudson River in contrast with the barriers studied in the area of New York Harbor (Raritan, Passaic, Hackensack, Bronx Rivers and lesser tributaries).



The barriers in the New York Harbor Area are distributed throughout the low gradient rivers in the watershed, whereas the barriers studied on the Hudson Tributaries tightly cluster near the Hudson River main stem due to the steep terrain of the Hudson Valley



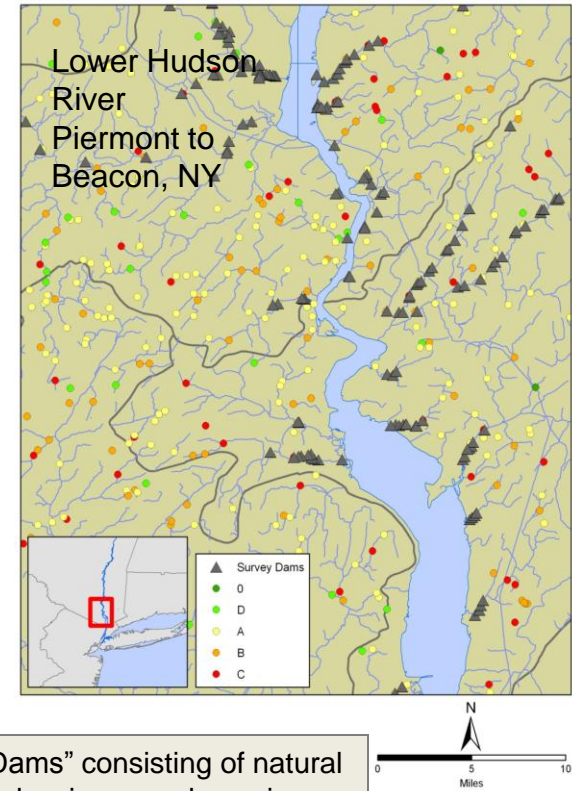


# So many dams, but who is watching them?

## The New York State DEC Dam Safety Database

NYSDSD Hazard Class	Description	Number of Dams in Study with Hazard Classification
A	Low Hazard	51
B	Intermediate Hazard	18
C	High Hazard	13
D	Negligible or No Hazard	4
		86

Of the 152 dams in our database, 86 are in NYSDSD. 66 are not.



•Our Survey “Dams” consisting of natural and man-made barriers are shown in relation to some of the over 6000 dam records in the NYS Dam Safety Database but more than 10,000 dams are estimated to exist in NYS. Nearly 800 dams in the Hudson River watershed. The DSD categorizes dams by the hazard they present. **Hazard Rating refers to consequences of a dam's failure, not the condition of the dam.**

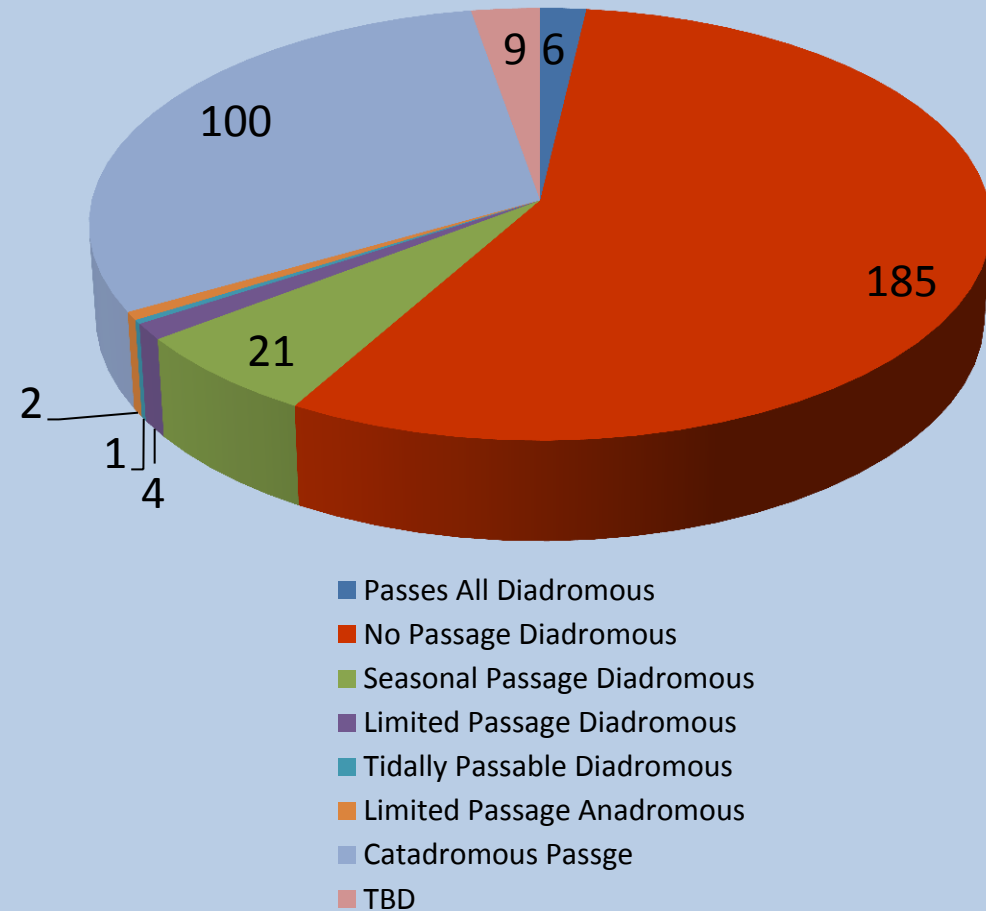
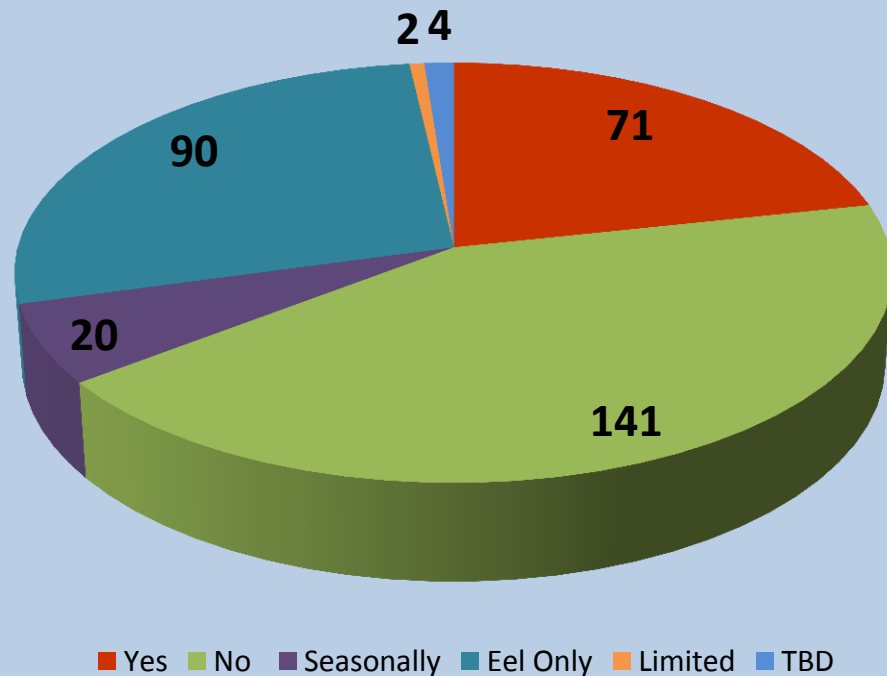
# NOAA STUDY IN PROGRESS 2009-2012



51 Tributaries Visited	216 Barriers Field Visited	211 Stream Miles in the Survey
14 Tributaries NOT Visited	112 Barriers Not Visited	3.25 Average #Miles/Stream
65 Tributary Streams	328 Total Barriers	5.05 Average # Barriers per Tributary
		0.64 Average distance in miles between barriers

.....And do (can) diadromous fish go beyond this point?

For all 328 potential barriers, we asked, can diadromous fish potentially arrive at this point?



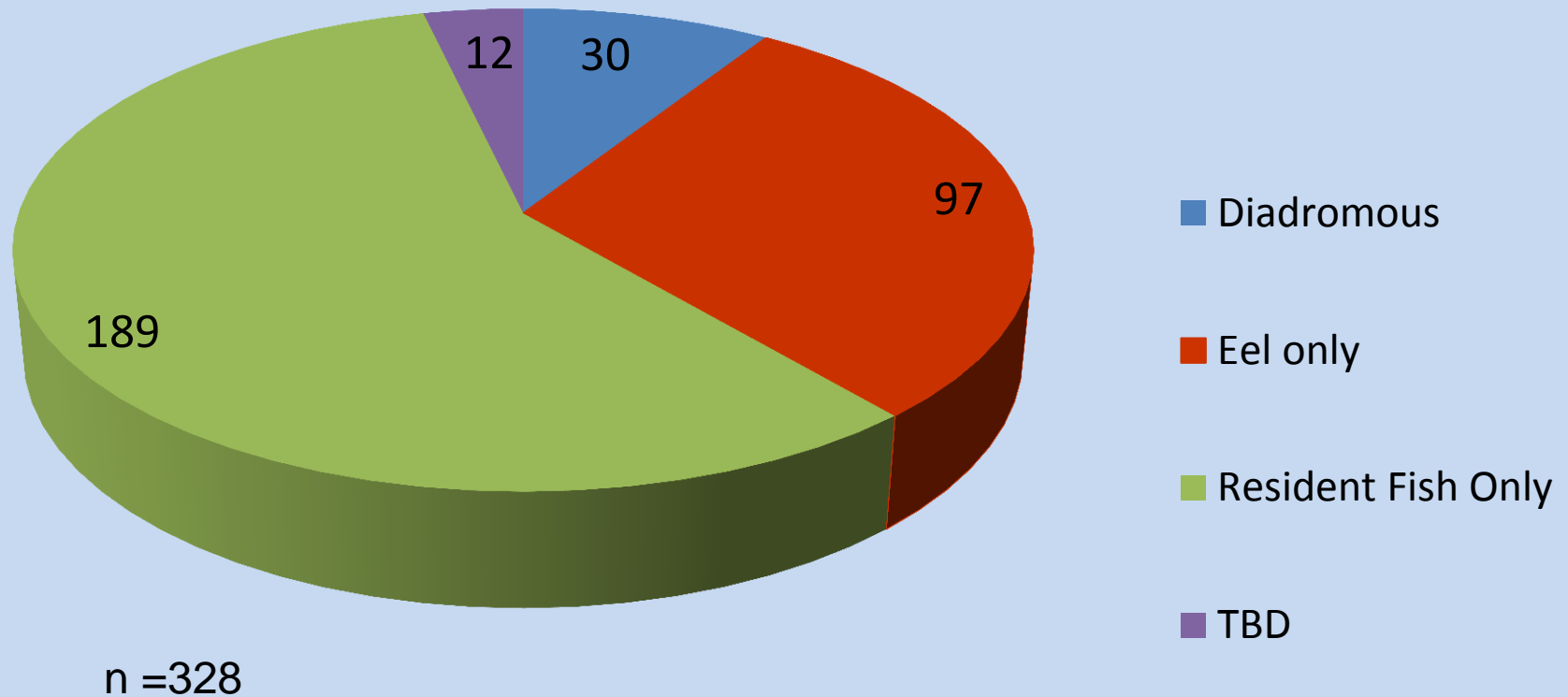
**BARRIER EFFECTIVENESS**



Approximately  
67 miles  
accessible to  
river herring

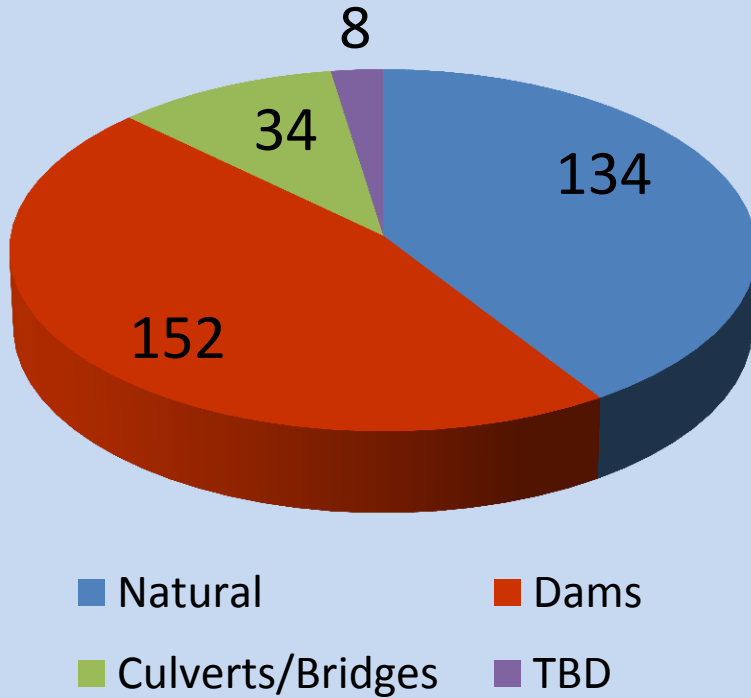


## Probable Current Run Type Beyond Barrier

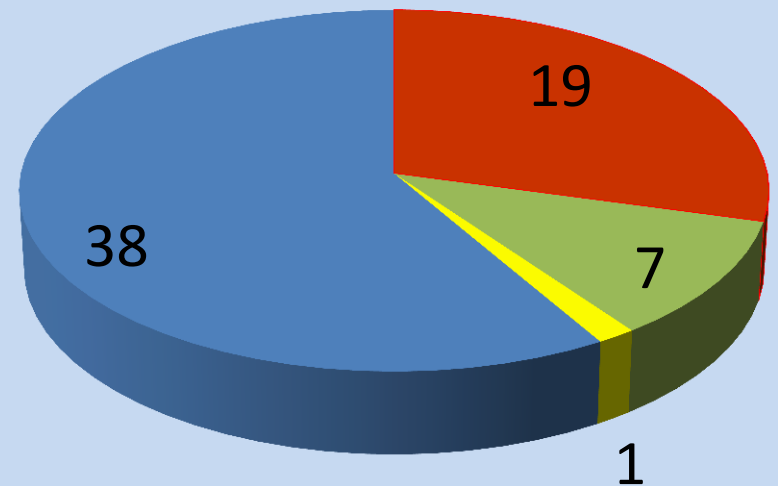


**BARRIER EFFECTIVENESS**

Of the 328 barriers surveyed, we asked,  
what are the major categories present?



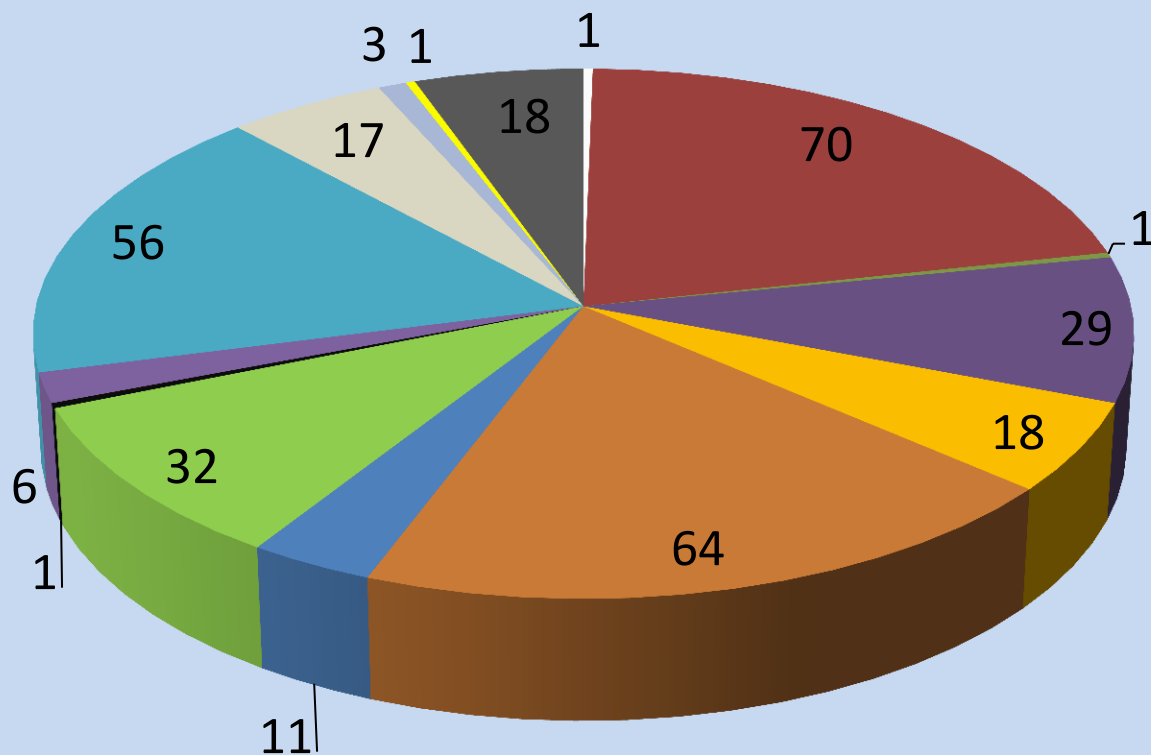
....And, what is the first barrier to river  
herring on each of the 65 tributaries?



■ Dam      ■ Culvert      ■ Bridge      ■ Natural

**BARRIER TYPES**

And, what is the land use/cover type?



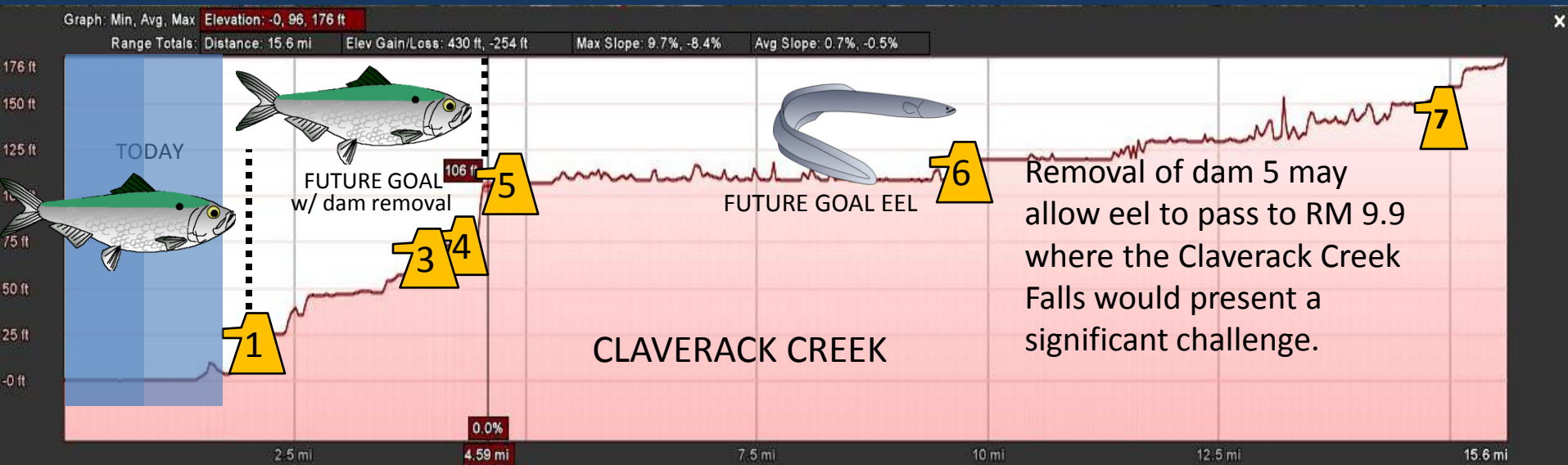
USGS LANDUSE DATA 2006

- Barren Land
- Deciduous Forest
- Developed High Intensity
- Developed Low Intensity
- Developed Medium Intensity
- Developed Open Space
- Emergent Herbaceous Wetland
- Evergreen Forest
- Grassland\_Herbaceous
- Mixed Forest
- NA
- Open Water
- Pasture Hay
- Shrub Scrub
- Woody Wetlands

LAND USE\_COVER TYPE



# Claverack Creek



**CLAVERRACK CREEK:** The spillway of Dam #1 is approx 24' elevation above the elevation at the mouth. It is a full barrier to fish passage.

Dam #2 is breached and does not effect passage. Removal of Dams 1, 3 and 4 results in an additional **2.62 miles** of passage for herring.

Removal of dams 1,3,4 would allow herring to pass to RM 4.5 where Dam #5 Stottsville Dam/Falls would present an obstacle to fish and a significant challenge eel – even if removed.

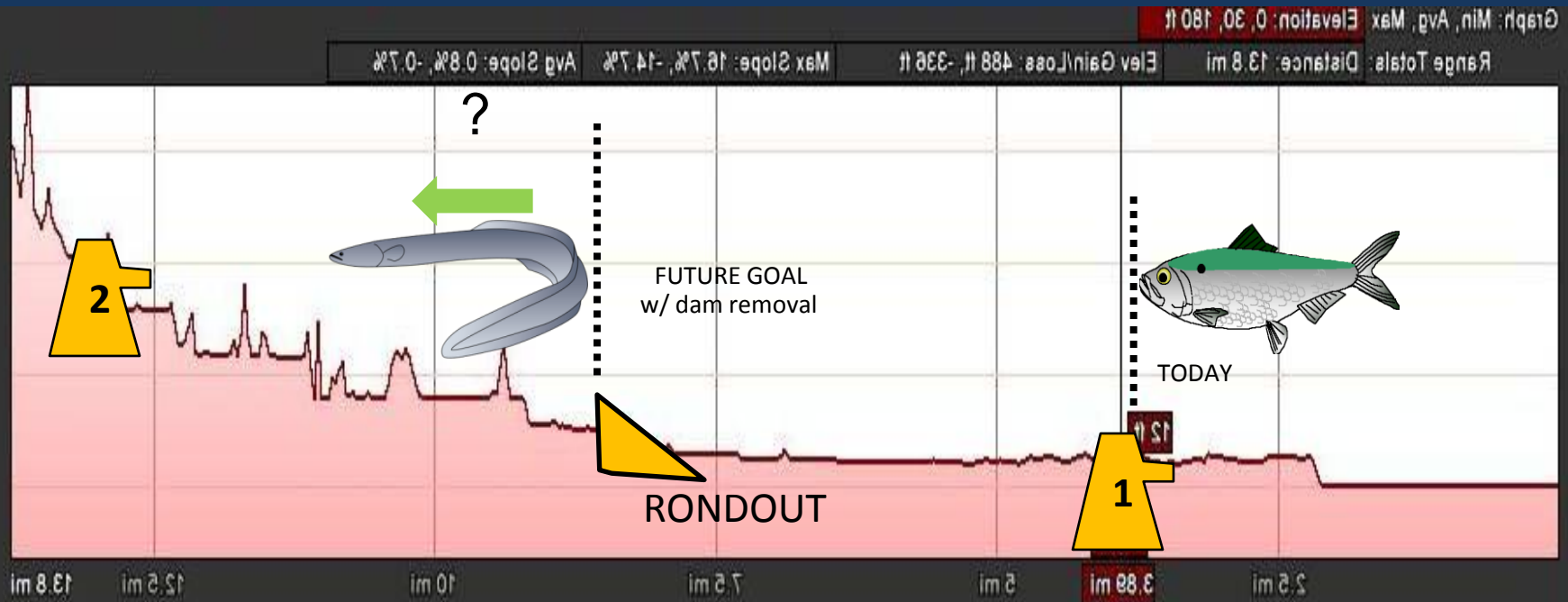
# Sprout Brook



**SPROUT BROOK:** Fish cannot pass beyond the 1<sup>st</sup> dam.

Assuming that the Cortland Lake Dam ( #3 ) 37' in height remains in place, removal of Dams 1 & 2 results in no more than an additional **1.22 miles** of passage for herring.

# Rondout Creek



**RONDOUT CREEK:** The 12' ft high Eddyville Dam (#1) stands at the head of tide. Without removing the dam, fish would have no further access beyond the base of the dam.

Removal of Dam #1 would result in head of tide migration to 3.6 miles upstream. Herring would likely pass to the natural ledges at RM 11.10 (7.1 stream miles). Eel would continue an undetermined distance – possibly to the next dam at RM 13.0



# Sixty-five Lower Hudson Tributaries: First Barrier is Either Natural or Man-made

Annsville Creek  
**Arden Brook**  
**Black Creek**  
Breakneck Brook  
Catskill Creek  
Cedar Point Brook  
**Cheviot Creek**  
**Claverack Creek**  
Coeymans Creek  
**Copper Mine Brook**  
Coxsackie Creek  
**Croton River**  
**Crows Nest Brook**  
Crumb Elbow  
**Dickey Brook**  
**Esopus Creek**

Fallkill  
Fallsburgh Creek  
Fishkill Creek  
**Foundry Brook**  
**Furnace Brook**  
Gordons Brook  
Hannacrois Creek  
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Indian Brook  
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**Kinderhook Creek**  
Landsman Kill  
Lattintown Creek  
Maritje Kill  
Mill Creek (C)

**Mill Creek (R)**  
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Moordener Kill  
Muitzes Kill  
**Murderers Creek**  
Normans Creek  
**Peekskill Hollow Brook**  
Philipse Brook  
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**Sparkill Creek**  
**Sprout Brook**  
Stockport Creek  
Stony Creek  
Twaalfskill Creek  
Vlockie Kill  
Vloman Kill  
**Wades Brook**  
**Wallkill River**  
Wappingers Creek  
Wickers Creek  
**Wynants Kill**

## 27 Tributaries Where First Barrier to Herring is Man-Made

Arden Brook  
Black Creek

Foundry Brook  
Furnace Brook  
Gordons Brook

Cheviot Creek  
Claverack Creek

Copper Mine Brook

Croton River  
Crows Nest Brook

Kinderhook Creek

Dickey Brook

Mill Creek (R)  
Minisceongo Creek  
Moodna Creek

Murderers Creek

Peekskill Hollow Brook

Pocantico River

Quassaic Creek

Rondout Creek  
Roseton Brook

South Bay Creek

Sparkill Creek  
Sprout Brook

Wades Brook  
Walkkill River

Wynants Kill

Culvert  
Dam

# 16 Tributaries Where Action for Herring Likely Prescribed

Tributaries were eliminated where first man-made barrier provides no realistic opportunities, e.g., FERC relicensing dams; dams and culverts whose location, size and structure make fish passage costly with little benefit; culverts that are technically infeasible; and barriers that provide passage to catadromous eel only.

Black Creek

Furnace Brook  
Gordons Brook

Cheviot Creek  
Claverack Creek

Croton River

Minisceongo Creek  
Moodna Creek

Peekskill Hollow Brook

Pocantico River

Quassaic Creek

Rondout Creek

South Bay Creek

Sparkill Creek  
Sprout Brook

Wynants Kill

Culverts : to be ground truthed  
Dam

# Based on the Quality and Amount of Benefits Gained

Removal of all barriers to herring provides an estimated 30 miles additional miles of habitat. Removal of 1<sup>st</sup> tier dams provides unrestricted access for herring to an estimated 19.6 miles of habitat.

Black Creek

Furnace Brook  
Gordons Brook

Cheviot Creek  
Claverack Creek

Croton River

Minisceongo Creek  
Moodna Creek

South Bay Creek

Sparkill Creek  
Sprout Brook

Peekskill Hollow Brook

Pocantico River

Quassaic Creek

Rondout Creek

Wynants Kill

First Tier Dams  
Second Tier Dams  
Second Tier Culverts

## Schmidt 1996 – Halavick 1998 Comparison of Findings

Tributary	Barrier	Schmidt Ranking	Schmidt/Cooper Recommendation	Halivak Ranking	Halavik/Orvis Recommendation
Rondout	Dam	1	construct passage	1	install fish ladder, best opportunity
Pocantico	Dam	2	construct passage		install fish ladder
Coxsackie	Falls	3	construct passage	NA	Not considered (not considered)
Stockport (Claverack and Kinderhook)	Rapids/Dams	4	remove rock at Stockport. remove Claverack dam, doubts migratory fish reach Claverack and Kinderhook dams		no action at Stockport Ledges and first dam on Kinderhook (FERC), Breach, notch, install fish ladder or remove first dam on Claverack
Sparkill	Dams	5	construct ladder, little evidence migratory fish spawn in this creek		install fish ladder on both dams
Muitzes	Culvert	6	install baffles for passage at low tide		no action
Poesten	Rapids	7	small amount of rock removal		no action
Wappinger	Rapids/Falls	8	remove rock/widen passage	NA	Not considered (natural barrier)
Quassaic	Ledges/Dam	9	remove rocks; could remove or bypass dam but didn't think removal would open up much spawning area since not sure of numbers of migratory fish that arrive at this point		citizen-led cleanups to extensive urban renewal of damaged riparian zone, breach or repair first dam
Black	Dam	10	remove flashboards and debris or dam removal, not sure if migratory fish reach this barrier		debris removal prior to and during spawning season
Wynants	Stop Log Control		not ranked in top 10, not identified as first barrier		curb non-point sources, clean up area, focus on mouth
Esopus	Dam on Top of Falls		not ranked in top 10, would require major passage project		Install fish ladder for educational outreach
Crumb Elbow	Dam on Top of Falls		not ranked in top 10, not identified as first barrier, remove rocks from rapids, didn't think ladder on dam could be built due to height and steepness		Install fish ladder for educational outreach



# Conclusions

An estimate of the stream miles encompassing the full historic migratory routes of river herring could not be determined from the available historic data, due to the limited number and accuracy of historic investigations and accounts.

There are currently **67** tributary miles estimated available to river herring on the 65 tributaries of the Lower Hudson based on criteria of biological and physical limits of fish passage.

An estimated **30** tributary miles have the potential to be opened to river herring via dam removal, culvert upgrades or the placement of passage structures (ramps, ladders, bypass structures).

Restoration opportunities (10 dams) on 4 tributaries (Claverack, Croton, Moodna, Rondout) could enhance access to habitat for an estimated **19.6** miles for river herring.



# What are the points to consider in a regional pre-assessment of multiple stream corridors w/multiple stream barriers?

- Even the high tech tools are blunt instruments
- Given limitations, pre-assessment provides a small subset of the data that will be required of a full feasibility study.
- Consider the limitations of available data within five areas of Feasibility (Site Control, Political, Regulatory, Cost and Technical)


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# Northeast Region

DAMAGE ASSESSMENT, REMEDIATION, &amp; RESTORATION PROGRAM

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#### Northeast Region

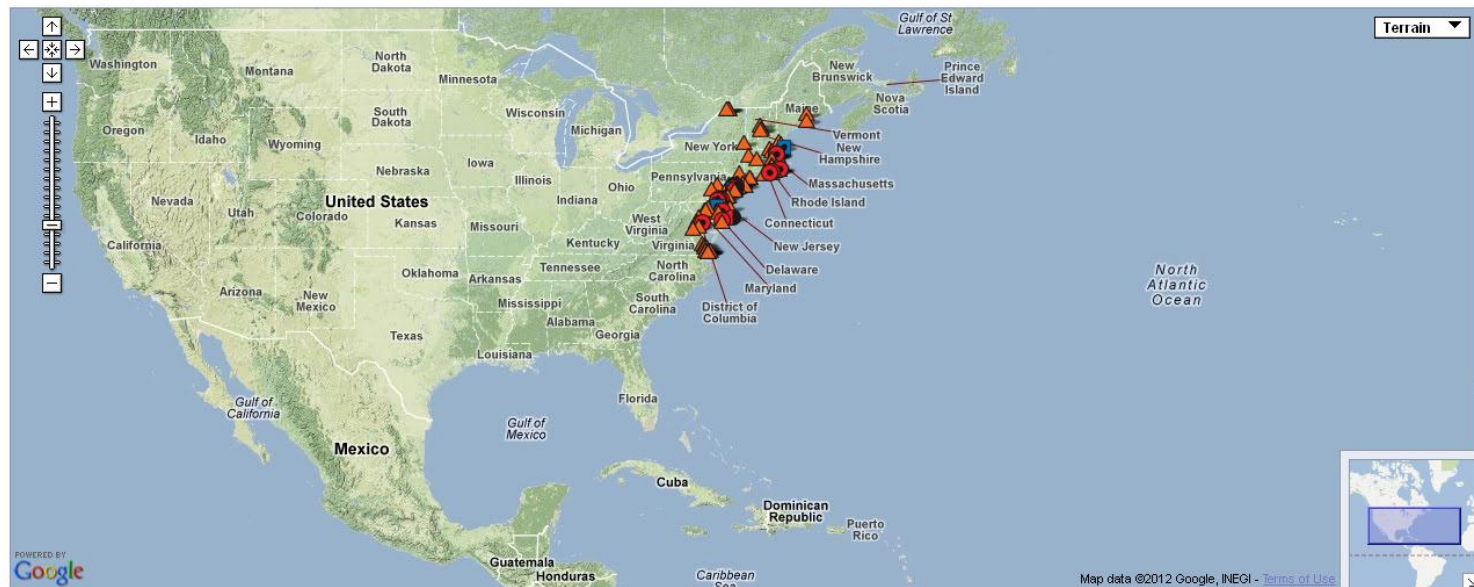
Connecticut  
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 Virginia

### DARRP Priority Cases FY2011

- ▲ Hazardous Waste Site
- Oil Spill Case

## Northeast Region

DARRP's Northeast Region covers Maine to Virginia and also includes Puerto Rico and the Virgin Islands. DARRP staff work with remedial agencies, co-trustees, and responsible parties to protect and restore NOAA trust resources injured by releases of hazardous materials and oil. These DARRP Web pages provide information on both current priority sites and selected past activities that are representative of the Program's accomplishments.



Download [DARRP Priority Cases KML](#) file. For more information on KMLs please visit the [Open Geospatial Consortium](#)

All priority cases are mapped. Featured cases are labeled and link directly to their specific case pages.

### Definitions

- **Priority cases** are those cases that the DARRP program believes, within current budget constraints, are most important to address this year because they provide greatest potential benefit to natural resources in NOAA's trust. The map above depicts locations of all the Program's FY2011 Priority Cases.

## Featured Cases

### Connecticut

- ▲ [GE Housatonic](#)
- ▲ [Lordship Point](#)

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- [Atheros Spill](#)
- [Bermuda Islander](#)
- ▲ [Dupont Newport](#)
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- ▲ [Koppers Company](#)

### Maryland

- [Chalk Point](#)
- ▲ [Spectron](#)

### Massachusetts

- [Buzzards Bay/Bouchard 120](#)
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- [Irving Oil, Chelsea Creek](#)
- [Island End River](#)
- ▲ [New Bedford Harbor](#)

### New Jersey

- [Atheros Spill](#)
- ▲ [Berry's Creek Watershed](#)
- [Chevron Perth Amboy Facility](#)
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- [Conoco-Phillips Bayway](#)
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- [Kinder Morgan Sodium Hydroxide Spill](#)

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